

WHAT IS CLAIMED IS:

1. A method of forming a semiconductor device including an interconnection formed of a conductor containing copper and a capacitor, comprising the steps of:
  - forming a first insulation layer;
  - 5 forming an interconnection hole and a capacitor hole in said first insulation layer;
  - filling said interconnection hole with the conductor containing copper to form an interconnection layer; and
  - partly filling said capacitor hole with the conductor containing
  - 10 copper to form one electrode of said capacitor,wherein said step of filling said interconnection hole with the said conductor containing copper to form said interconnection layer and said step of partly filling said capacitor hole with the said conductor containing copper to form one electrode of said capacitor are performed in a single process step.
2. The method of manufacturing a semiconductor device according to claim 1, further comprising the step of forming a coating layer covering said interconnection layer and one electrode of said capacitor.
3. The method of manufacturing a semiconductor device according to claim 2, wherein said coating layer covering said interconnection layer is a barrier layer.
4. The method of manufacturing a semiconductor device according to claim 2, further comprising the steps of:
  - removing said coating layer covering said interconnection layer; and
  - forming a barrier layer covering said interconnection layer.
5. The method of manufacturing a semiconductor device according to claim 1, further comprising the steps of:
  - forming a second insulation layer so as to cover said coating layer

covering said interconnection layer and one electrode of said capacitor;  
5        forming an upper interconnection hole and a hole for forming the  
other electrode in said second insulation layer;  
      filling said upper interconnection hole with a conductor containing  
copper to form an upper interconnection layer; and  
      filling said hole for forming the other electrode with the conductor  
10       containing copper to form the other electrode of said capacitor,  
      wherein said step of filling said upper interconnection hole with the  
said conductor containing copper to form said upper interconnection layer  
and said step of filling said hole for forming the other electrode with the said  
conductor containing copper to form the other electrode of said capacitor are  
15       performed in a single process step.

6. A semiconductor device including an interconnection and a  
capacitor, wherein  
      said interconnection and one electrode of said capacitor are both  
formed of a conductor containing copper; and  
5       a barrier layer formed to cover said interconnection and a dielectric  
layer of said capacitor are formed with the same layer.

7. A semiconductor device including an interconnection and a  
capacitor, wherein  
      said interconnection and one electrode of said capacitor are both  
formed of a conductor containing copper; and  
5       a barrier layer formed to cover said interconnection and a dielectric  
layer of said capacitor are formed with layers different from each other.

8. The semiconductor device according to claim 6, comprising an  
interconnection hole in which said interconnection has been formed, and a  
capacitor hole in which said capacitor has been formed,  
      wherein a volume of said interconnection hole is smaller than a  
5       volume of said capacitor hole.

9. The semiconductor device according to claim 6, comprising a capacitor hole in which said capacitor has been formed,  
wherein said capacitor hole has a first portion and a second portion which have diameters different from each other, and  
5 a diameter of said capacitor hole changes discretely at a boundary between said first portion and said second portion.